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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/711,198	09/01/2004	Jiunn-Ren Hwang	NAUP0493USA4	5197

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NORTH AMERICA INTERNATIONAL PATENT OFFICE (NAIPC)  
P.O. BOX 506  
MERRIFIELD, VA 22116

EXAMINER
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MOHAMEDULLA, SALEHA R

ART UNIT	PAPER NUMBER
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1756

DATE MAILED: 06/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/711,198

Applicant(s)

HWANG ET AL.

Examiner

Saleha R. Mohamedulla

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 01 September 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 1/4/05.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

Claims 1-14 are pending.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over US# 6,001,512 to Tzu et al. in view of US# 6,294,295 to Lin et al.

Tzu teaches a mask and method of systematically laying out the mask for test patterns in the frame cell region of an attenuating phase shifting mask are described. An array of sub-resolution contact holes are used in the border regions of the mask to prevent over exposure of photoresist in the regions between the device regions on a wafer due to side lobe effect. The mask and method provide for a buffer distance surrounding the features of the test patterns. The buffer distance is free of sub-resolution contact holes. When the buffer distance is correctly chosen problems due to side lobe effect at the frame cell portion of the mask are prevented (Abstract). FIG. 2 shows a top view of a part of a mask to be used in a stepper in forming a pattern on an integrated circuit wafer. FIG. 2 shows the device region 12, the border region 14 and the frame cell regions 16. FIG. 3 shows a test pattern to be located in the frame

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cell region. The test pattern in this example is a box in box pattern having an outer box 22 and an inner box 24 which is to be placed in the frame cell region 16 of the mask. The frame cell region is located in an array of sub-resolution contact holes 20, as shown in FIG. 4. As shown in FIG. 5, the border region 14, which is an array of sub-resolution contact holes 20, surrounds the device region 12. The frame cell region 16 is located in the border region 14 (col. 3, lines 10-25). Other examples of test patterns are shown in FIGS. 9 and 10. FIG. 9 shows a test line test pattern having three test lines, 34, 36, and 38 surrounded by a buffer distance 30 before beginning the pattern of sub-resolution contact holes 20. FIG. 10 shows a critical dimension test pattern having an array of shapes 40 representing critical dimensions each surrounded by a buffer distance 30 before beginning the pattern of sub-resolution contact holes 20 (col. 3, line 62 – col. 4, line 2).

The three lines 34, 36, and 38 or the shapes 40 are the integrated circuit layout and the surrounding region is the at least one blank region. The sub-resolution contact holes are the plurality of dummy patterns. These patterns do not resolve. Because the holes prevent over-exposure of the photoresist and the buffer region is correctly chosen to prevent side lobe effect, the dummy patterns reduce the difference in pattern density so as to modify optical proximity correction. Tzu teaches exposure of the mask at least in the abstract.

Tzu teaches the limitations discussed above in paragraph 2. Tzu does not specifically teach the multiple ranges recited in claims 24-26. Because the contact holes are sub-resolution, it is an obvious variation of the design size of the contact holes to be less than a multiple of 0.6 of the exposure wavelength or greater than a multiple of 0.3 of the exposure wavelength. Also,

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the buffer distance is chosen to avoid side lobe effects, therefore, the distance of 0.4 to 2.0 of the exposure wavelength is obvious.

Tzu teaches an attenuating phase shift mask but does not teach 180 degree phase shift.


Lin teaches an attenuating phase shift mask that provides a 180 degree phase shift (Abstract).

The references are analogous art as they are drawn to attenuating phase shift masks with contact hole patterns. It would be obvious to one of ordinary skill in the art to use the 180 degree phase shift in Tzu as Lin teaches that a 180 degree phase shift is common in attenuating phase shift masks.

### *Conclusion*

2. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Saleha Mohamedulla whose telephone number is (571) 272-1387. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Saleha R. Mohamedulla  
Patent Examiner  
Technology Center 1700  
June 23, 2005